What is claimed is:

1. A process for preparing 3-pentenenitrile by hydrocyanating 1,3-butadiene, characterized by the following process steps:

(a) reacting 1,3-butadiene which comprises cis-2-butene with hydrogen cyanide over at least one catalyst to obtain a stream 1 which comprises 3-pentenenitrile, 2-methyl-3-butenenitrile, the at least one catalyst, 1,3-butadiene and residues of hydrogen cyanide which has yet to be converted,

(b) distilling stream 1 in a distillation apparatus K1 to obtain a stream 2 as the top product which comprises the predominant portion of the 1,3-butadiene from stream 1, and a stream 3 as the bottom product which comprises 3-pentenenitrile, the at least one catalyst, 2-methyl-3-butenenitrile and the remaining portion of the 1,3-butadiene from stream 1 which has not been removed in stream 2,

(c) distilling stream 3 in a distillation apparatus K2 to obtain a stream 4 as the top product which comprises 1,3-butadiene, a stream 5 which comprises 3-pentenenitrile and 2-methyl-3-butenenitrile at a side draw of the column, and a stream 6 as the bottom product which comprises the at least one catalyst,

(d) distilling stream 5 to obtain a stream 7 as the top product which comprises 2-methyl-3-butenenitrile, and a stream 8 as the bottom product which comprises 3-pentenenitrile,

the distillation apparatus K1 used in process step (b) comprising at least one distillation column having a stripping section and/or

the distillation apparatus K2 used in process step (c) having distillative separation stages between the feed of stream 3 and the draw of stream 5 being disposed lower in the distillation apparatus K2 than the feed of stream 3.

2. The process according to claim 1, wherein the distillation column K1 used in process step (b) has from 2 to 60 theoretical plates.

3. The process according to claim 1 or 2, wherein the stream 2 which is obtained in process step (b) and comprises 1,3-butadiene is recycled into process step (a), and/or the stream 4 which is obtained in process step (c) and comprises 1,3-butadiene is recycled into process step (a) and/or (b).

4. The process according to any of claims 1 to 3, wherein a substream 4b from the stream 4 obtained in process step (c) is discharged.

5. The process according to any of claims 1 to 4, wherein the distillation apparatus K1 used in process step (b) has separation stages below the feed of stream 1 which enable enrichment of cis-2-butene relative to 1,3-butadiene in stream 3, and a substream 4b from the stream 4 obtained in process step (c) is discharged.

6. The process according to claim 4 or 5, wherein the discharge is in gaseous form.

7. The process according to any of claims 1 to 3, wherein, in the rectifying section of the distillation column K1 in process step (b), a stream is obtained in the boiling state at a side draw of the distillation apparatus K1, condensed on a condenser by indirect heat removal to obtain a cooled stream and recycled to the top of the distillation apparatus K1 of process step (b), and a stream 2' is drawn off before or after the condensation and the stream 2' is recycled into process step (a) instead of stream 2.

8. The process according to any of claims 1 to 7, wherein, in process step (c) before stream 4 is obtained, nitrile-containing compounds are depleted from the vapor stream by multistage condensation.

9. The process according to any of claims 1 to 8, wherein 1,3-butadiene required in addition to the recycled 1,3-butadiene is fed to process step (a).

10. The process according to any of claims 1 to 9, wherein 1,3-butadiene used in the process has no stabilizer, and a suitable selection of the pressure conditions keeps the condensation temperatures in the top region of the distillation apparatus K1 of process step (b) less than 293 K in order to prevent polymerization of 1,3-butadiene, especially in order to limit the growth of popcorn polymer nuclei.